Assignment 8

Refrigeration and Air Conditioning

Textbook Assignment: Engineman 1&C, NAVEDTRA 10543-E1, Pages 6-1 through 7-4

Learning Objective: Indicate how the output of reciprocating refrigeration compressors can be controlled and point out some of the precautions and practices that must be followed when maintaining compressor condensers, and thermostatic expansion valves.

● Question 8-1 is to be judged True or False.

8-1. The output of most high speed reciprocating compressors is controlled by loading and unloading the compressor cylinders.

8-2. In figure 6-8 of your textbook, what will happen when an increase in oil pump pressure causes the piston of the capacity control valve to move against spring A?

1. More cylinders will become loaded and the compressor output increases
2. More cylinders will become unloaded and the compressed output decreases
3. The regulating valves will relieve the oil pressure
4. The compressor output will remain the same

8-3. Which of the following precautions should you take when disassembling and reassembling a compressor unit?

1. Carefully disassemble and remove the parts, noting the correct relative positions so errors will not be made reassembling
2. Make sure that all parts, including those being replaced or reinstalled, are free of dirt and moisture
3. Apply compressor oil freely to all bearings and rubbing surfaces of the parts being replaced or reinstalled
4. Each of the above

8-4. An air compressor has been overhauled. What is the first step you should take to remove the air from a compressor?

1. Disconnect the connection in the discharge gage line between the stop valve and the compressor
2. Disconnect the connection on the compressor suction line
3. Start the compressor and let it run until a vacuum is obtained
4. Remove all oil from the compressor crankcase

● Question 8-5 is to be judged True or False.

8-5. R-12 is an excellent solvent. It has the ability to loosen and remove any foreign matter with which it comes in contact within a refrigeration system.

8-6. In which of the following parts would air that enters a refrigeration plant tend to collect?

1. Upper part of the receiver
2. Upper part of the condenser
3. Inlet end of the condenser
4. Downstream end of the cooling coil

8-7. In a refrigeration system, what is the purpose of the purge valve at the top of the condenser?

1. Take out unpleasant fumes from the refrigerant
2. Vent off excess refrigerant during an emergency
3. Remove any air that may accumulate in the system
4. Permit the opening of the refrigerating system for cleaning and inspecting

8-8. What method should you use to remove foreign deposits from the tubes of a refrigerant condenser?

1. Lance with water only
2. Lance with air only
3. Both 1 and 2 above
4. Wash with acid solution

8-9. On an air-cooled condenser, the exterior surfaces of the tubes and fins are dirty and restricting air circulation. What should be used to clean these surfaces?

1. Jets of steam
2. Hot water lances
3. Compressed air lances
4. Stiff bristled brushes

8-10. How often should the water side of a condenser in a freon system be tested for refrigerant leakage?

1. Daily
2. Weekly
3. Bi-weekly
4. Monthly

8-11. You are testing condenser tubes for leakage. Why do you hold the exploring tube of the leak detector at one end of each condenser tube for about 10 seconds before driving a cork into each end of the tube?

1. To dry the tube heads
2. To detect the presence of R-12
3. To draw fresh air through the tube
4. To vaporize any water left in the tube

8-12. You are attempting to locate leaks in a refrigerator condenser. For what period of time should the condenser be allowed to remain idle after all tubes in the suspected section have been corked, before continuing the test?

1. 2 to 4 hr
2. 4 to 6 hr
3. 6 to 8 hr
4. 8 to 10 hr

8-13. A refrigeration unit is working under a normal heat load and has a sufficient charge of refrigerant. The water side of the condenser should be cleaned if the operating difference between the temperature corresponding to the condensing pressure and the temperature of the outlet circulating water increases above the temperature obtained when the unit was in good condition by how many degrees?

1. 5°F to 10°F
2. 10°F to 20°F
3. 20°F to 30°F
4. 30°F to 40°F

8-14. How does the temperature at the outlet side of the valve compare with the temperature at the inlet side when the thermostatic valve is operating properly?

1. The temperature is lower at the outlet side
2. The temperature is lower at the inlet side
3. The temperature is approximately the same at the outlet and the inlet sides
4. The temperature is higher at the inlet side

8-15. Which of the following factors can cause a thermostatic expansion valve to operate improperly?

1. A collection of dirt on the control bulb
2. A collection of freon at the valve seat
3. A collection of dirt at the valve orifice
4. Each of the above factors

8-16. As a rule, about how many degrees of superheat are picked up by the refrigerant vapor before it leaves the cooling coil?

1. Between 4°F and 12°F
2. Between 15°F and 20°F
3. Between 30°F and 38°F
4. Between 45°F and 50°F

● Question 8-17 is to be judged True or False.

8-17. If you increase the spring pressure of the thermostatic expansion valve to give a high degree of superheat at the evaporator coil outlet, you may cause a low lube oil level in the compressor crankcase.

8-18. In a refrigerant plant, liquid refrigerant may flood back to the compressor from the evaporator if the thermostatic expansion valve is

1. stuck shut
2. adjusted for too high superheat at the outlet
3. adjusted for too low superheat at the outlet
4. reducing the amount of refrigerant flowing into the coil

8-19. If it is suspected that the expansion valve assembly requires replacement, which of the following conditions should be met before an expansion valve test is made?

1. The liquid strainers are cleaned
2. The solenoid valves are operative
3. The system is sufficiently charged
4. Each of the above

8-20. What should a service drum that is used for testing an expansion valve contain?

1. Pressurized R-12
2. Dry compressed air
3. A gas similiar to the one used in the thermal element of the valve
4. Each of the above gasses

● For questions 8-21 through 8-24, assume that you are testing the thermostatic expansion valve of a refrigeration plant.

8-21. When should the thermal element be immersed in a bath of crushed ice?

1. Before the valve inlet is attached to the gas source
2. After the high and low pressure gages have been connected
3. Before the high pressure gage is connected to the valve outlet
4. After the valve on the air supply line has been opened

8-22. A thermostatic expansion valve is set for 5°F of superheat, what should the outlet pressure read on a gage?

1. 16.1 psi
2. 22.5 psi
3. 26.1 psi
4. 32.5 psi

8-23. Which of the following operating conditions is an indication that the expansion valve is seating properly?

1. Low pressure gage stops increasing after a few pounds
2. Low pressure gage continues to increase slowly after a few pounds
3. Either 1 or 2 above happens
4. Low pressure gage increases rapidly and equals the inlet pressure

8-24. You have removed the ice packing from the control bulb. Which of the following outlet pressure conditions indicates that the valve is operating normally?

1. The pressure does not change
2. The pressure decreases rapidly
3. The pressure increases rapidly
4. The pressure decreases a few pounds, then stabilizes

● Question 8-25 is to be judged True or False.

8-25. The entire expansion valve assembly must be replaced when the power element is inoperative.

Learning Objective: Recognize practices that will help assure a properly operating refrigeration and air conditioning system, and identify some of the symptoms that may lead to system failure.

8-26. Under normal operating conditions how full should the receiver of a properly charged refrigeration system be when the compressor stops?

1. 25% full
2. 50% full
3. 85% full
4. 100% full

8-27. During plant operation, which of the following symptoms will indicate a clogged R-12 liquid line strainer?

1. The temperature of the tubing on the outlet side of the strainer is much warmer than the tubing on the inlet side
2. The temperature of the tubing on the inlet side of the strainer is much warmer than the tubing on the outlet side
3. The pressure on the outlet side of the strainer tubing is much higher than on the inlet side
4. The pressure on both the inlet and outlet sides of the strainer tubing are the same

8-28. Which action should you take prior to tightening the cap on a liquid line strainer that has been cleaned?

1. Test the strainer for leaks
2. Open the strainer outlet valve
3. Purge the air out of the strainer
4. Replace the strainer screen spring

8-29. Which of the following conditions may be caused by excessive buildup of frost on the cooling coils?

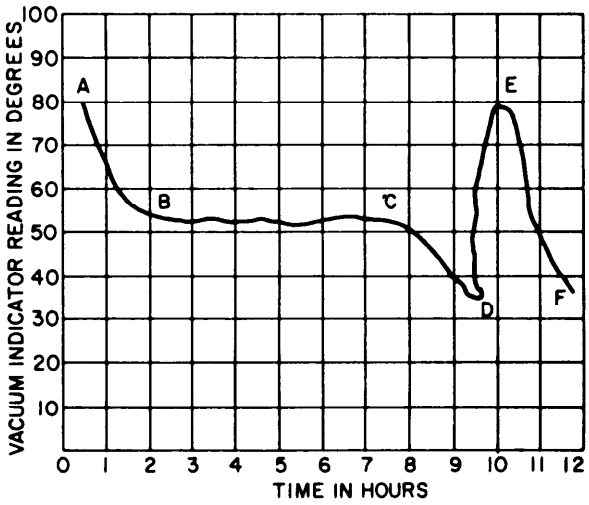
1. Low suction pressure
2. High suction pressure
3. Both 1 and 2 above
4. High condensing pressure

8-30. Which of the following factors help(s) determine the maximum time between defrosting of the cooling coils?

1. Amount of refrigerant in the system
2. Moisture content of the supplies
3. Amount of heat to be removed
4. All of the above

8-31. Cooling coils should be defrosted before the frost thickness reaches

1. 1/4 in.
2. 3/16 in.
3. 1/8 in.
4. 5/16 in.



● Questions 8-32 and 8-33 are based on Figure 8-A.

8-32. Approximately how many inches of mercury represent the difference in temperature between points B and D?

1. 0.200 in. absolute
2. 0.232 in. absolute
3. 0.436 in. absolute
4. 0.640 in. absolute

8-33. Initial evacuation of the refrigerating system begins at point A and is completed at point

1. B
2. C
3. D
4. E

8-34. While you are evacuating and dehydrating a refrigeration system, the vacuum indicator fails to attain 35°F, which of the following conditions may be the cause of this failure?

1. Lack of lubricating oil in the compressor crankcase
2. Lack of moisture in the system
3. R-12 in the lubricating oil
4. Each of the above conditions

8-35. To be properly reactivated, dehydrating agents should be heated to (a) what temperature and (b) for how long?

1. (a) 200°F (b) 12 hr
2. (a) 300°F (b) 12 hr
3. (a) 400°F (b) 6 hr
4. (a) 500°F (b) 6 hr

8-36. If you do not have a tank-type cleaner, you can clean an R-12 system by which of the following means?

1. By flushing boiling water through the system three times
2. By blowing hot air through the system with a blower for 24 hours
3. By inserting a hard wool felt filter in the suction strainer screen and operating the plant with an operator
4. By using any one of the above methods

● Question 8-37 is to be judged True or False.

8-37. The 2 PD air conditioning control may be used where one common cooling coil serves several different spaces.

8-38. How should you clean the sensing elements in humidistats?

1. Use a soft brush
2. Blow gently with air
3. Spray with soap and water solution
4. Use a hard brush

Learning Objective: Recognize troubles that may be encountered with refrigeration and air conditioning systems, and point out corrective measures that may be required.

8-39. What should you do to correct low condensing pressure in an operating refrigeration system?

1. Reduce the water supply
2. Increase the water pressure
3. Clean the valves and the valve nests
4. Adjust the high-pressure cutout switch

8-40. Insufficient refrigerant in a refrigeration plant may cause which of the following problems?

1. High discharge pressure
2. Low suction pressure
3. Frosting of the crankcase
4. High temperature of the overboard water

8-41. Which of the following actions should you take to correct a low condensing pressure in a refrigeration system?

1. Add refrigerant
2. Purge the condenser
3. Increase the compressor speed
4. Adjust the thermostatic expansion valve

8-42. In an R-12 refrigeration plant, what is the probable cause if the compressor runs continuously?

1. An open solenoid valve switch
2. An inadequate supply of refrigerant
3. Clogged condenser tubes
4. An excess of liquid refrigerant

8-43. What are the two symptoms that indicate an inadequate supply of water is passing through the condenser of a refrigeration plant?

1. Excessively low temperature of the overboard water and low discharge pressure
2. High suction pressure and high temperature of the suction line
3. High condensing pressure and compressor short cycling on high pressure switch
4. High suction line temperature and high discharge pressure

8-44. The cut-in point is set too high on the low pressure control switch to an R-12 refrigeration system. How will this affect the functioning of the compressor?

1. The compressor will short cycle
2. The compressor will not operate
3. The compressor will operate unloaded
4. The compressor will operate continuously

8-45. Which of the following conditions is probably caused by an improperly adjusted pressure regulating valve in a refrigeration system?

1. The refrigerant is bubbling
2. The sudden loss of oil from the crankcase
3. The compressor continues to operate unloaded
4. The oil fails to return to the compressor crankcase

Learning Objective: Point out the general practices, maintenance requirements, and tasks necessary for proper operation of air compressors and related system components, and identify the safety precautions to be followed.

8-46. Aboard Navy ships, in which of the following situations would you most likely use HP air?

1. To clean machinery
2. To start diesel engines
3. To operate pneumatic tools
4. Each of the above

8-47. Which of the following statements about general procedures for maintaining air compressors is true?

1. The same procedures are used for low, medium, and high pressure systems except for the additional safety precautions which are observed in caring for high pressure compressors
2. The procedures vary with the type of compressed air system, compressor design, and compressor capacity
3. The procedures are the same for low and medium pressure systems, but for high pressure systems they vary with compressor design and capacity
4. The procedures for low, medium, and high pressure systems made by one manufacturer differ from the procedures used for the systems made by another manufacturer

● Question 8-48 is to be judged True or False.

8-48. Good engineering practice in making repairs is to use the proper tools and to observe all safety precautions and manufacturers' instructions.

8-49. What may be expected when a wrench extension is used to apply more than the specified torque on bolts in order to obtain a tight connection at a gasket joint?

1. Sprung gasketed joints
2. Damaged gaskets, bolts twisted off, and/or insufficient tightness of the joint
3. Either 1 or 2 above
4. Tight joints

8-50. Which of the following statements describes the recommended procedures for cleaning an oil wetted filter element that was removed from a compressor intake?

1. Clean with gasoline or kerosene, dip in lightweight oil, and drain excess oil
2. Clean with steam or strong sal soda solution, dip in clean medium viscosity oil, and drain excess oil
3. Clean with a jet of hot water, dip in kerosene, and drain excess kerosene
4. Clean with kerosene, drain excess kerosene, dip in medium viscosity oil, and drain excess oil

8-51. How is moisture prevented from circulating throughout the air system?

1. By preheating the inlet air
2. By blowing down the compressor inter-coolers
3. By placing coalescent filters in the compressor discharge line
4. By preheating the inter-coolers

● Question 8-52 is to be judged True or False.

8-52. In a two-stage compressor a defective inlet valve in the second stage may be indicated by an increase in the inter-cooler pressure, and a defective discharge valve in the first stage may be indicated by a decrease in the inter-cooler pressure.

8-53. Leakage through the discharge valves of an air compressor is usually caused by which of the following factors?

1. Dirt in the valves
2. Moisture in the air
3. Overcompression of air in the cylinders
4. Insufficient compression of air in the cylinders

8-54. How can you reduce the frequency with which air valve troubles occur or possibly prevent them from occurring?

1. By keeping the pressure high in the intercooler
2. By inspecting and cleaning the valves and the valve passages regularly
3. By periodically circulating high temperature air around the valves
4. By periodically blowing off the valve cover to keep it from becoming too hot

8-55. Carbonized air compressor valves should be cleaned by soaking in

1. gasoline, followed by dressing with emery
2. a solution of kerosene and mineral oil
3. kerosene, followed by a light brushing or scraping
4. a strong soda solution, followed by a stiff brushing

8-56. When you are inserting valves in a compressor cylinder, you should make sure that they open in which direction?

1. Discharge valves open toward the center and suction valves open away from the center of the cylinder
2. Suction valves open toward the center and discharge discharge valves away from the center of the cylinder
3. Discharge valves and suction valves open toward the center of the cylinder
4. Suction valves and discharge valves open away from the center of the cylinder

● Questions 8-57 and 8-58 are to be judged True or False.

8-57. One method of stopping leakage at the threads of the valve setscrew of a high pressure compressor is to wind a piece of wire solder around the threads and tighten the locknut over it.

8-58. The manufacturer's technical manual should contain detailed instructions for the adjustment and maintenance of the various control devices to the air system components.

8-59. What material is used to repack the filter of an air compressor control valve?

1. Wool or sponge
2. Cotton or wool
3. Linen or sponge
4. Nylon or steel wool

8-60. Which of the following components of a compressed air system is vital for its safe operation?

1. Control valve
2. Discharge valve
3. Suction valve
4. Relief valve

8-61. What liquid should be used to fill the sight flow indicator that provides cylinder lubrication to a compressor which uses 9250 Navy Symbol oil?

1. Distilled water
2. Mineral oil
3. Glycerine
4. Each of the above

● Question 8-62 is to be judged True or False.

8-62. The sight flow indicators should be filled with equal parts of glycerine and mineral oil when the machinery cylinders are lubricated with a Navy Symbol 2000 series oil.